



# Groundwater Quality Trend Monitoring

**East San Joaquin Water Quality Coalition**

**Central Valley Regional Water Board**

May 1, 2019

## 2019 ANNUAL REPORT EXCERPTS

The East San Joaquin Water Quality Coalition's (ESJWQC or Coalition) Groundwater Quality Trend Monitoring Program (GQTM) was initiated in October 2018. The GQTM network is designed to provide groundwater quality information for evaluation based on land use activities at different spatial scales. Monitoring for dissolved oxygen, temperature, pH, oxidation-reduction potential, specific conductance, depth to standing water, turbidity, and nitrate + nitrite as nitrogen will occur annually. Every five years, the Coalition will also analyze for anions and cations in groundwater.

The ESJWQC reported 2018 GQTM results (including a quality assurance assessment) in the 2019 Annual Report. All sections in the 2019 Annual Report pertaining to GQTM are provided as excerpts in the sections below. The page numbers indicated in the excerpts are the associated page numbers within the main body of the 2019 Annual Report.

## GROUNDWATER MONITORING OBJECTIVES AND DESIGN

The Coalition is responsible for collecting “sufficient data to describe irrigated agricultural impacts on groundwater quality and to determine whether existing or newly implemented management practices comply with the groundwater receiving water limitations of the Order” (Attachment B of WDR). The strategy for evaluating groundwater as described in the Revised Order includes 1) the Groundwater Assessment Report (GAR), 2) the Management Practices Evaluation Program (MPEP), 3) the Groundwater Quality Trend Monitoring Program (GQTM), and 4) the implementation of Groundwater Quality Management Plans (GQMPs) that includes Groundwater Protection Targets (to be reported in the July 1, 2021 Management Practice Implementation and Nitrogen Application Report). The following section provides the monitoring objectives and minimum sampling and reporting requirements for the GQTM.

The ESJWQC is part of the Central Valley Groundwater Monitoring Collaborative (CVGMC) which consists of multiple Central Valley Coalitions that will combine their GQTM results for a period of time to produce one report on groundwater quality and trends. On May 16, 2018, the CVGMC submitted a technical work plan with a list of trend monitoring wells for each Coalition and it was conditionally approved on September 17, 2018. Amendments to the work plan were to be submitted by May 1, 2019. The CVGMC also developed a Quality Assurance Program Plan (QAPrP) which includes program specific quality assurance and control requirements for each of the well monitoring projects. Appendix I of the QAPrP includes project specific quality assurance requirements for each of the participating coalitions including the ESJWQC Quality Assurance Project Plan (QAPP). A revised QAPrP and associated appendices was submitted to the Regional Board on April 1, 2019. All groundwater monitoring performed by the Coalition in 2018 was according to the protocols listed within the ESJWQC QAPP. All 2018 WY submittal/approval dates associated with the GQTM are included in Table 51.

Information pertaining to the MPEP and the GQMP can be found in the Groundwater Management Plan Activities and Performance Goals section of this report.

### MONITORING OBJECTIVES

The GQTM program objectives are listed below. The first two objectives are WDR requirements and the other three were developed specifically for the ESJWQC region.

- Determine current water quality conditions of groundwater relevant to irrigated agriculture,
- Develop long-term groundwater quality information that can be used to evaluate the regional effects of irrigated agricultural practices and changes in agricultural practices,
- Understand long-term temporal trends in regional groundwater quality, particularly as they relate to effects from irrigated agriculture on potential sources of drinking water for communities,
- Evaluate groundwater quality conditions in the Coalition area, particularly in the groundwater High Vulnerability Areas (HVAs) as identified in the GAR, and identify differences in water quality horizontally and vertically within the Coalition region, and

- Distinguish water quality changes associated with irrigated agriculture compared to other non-agricultural factors.

## MONITORING DESIGN

The GQTM design is comprised of two categories of network wells including:

- *Principal wells* - meet the GQTM requirements of the WDR and can be accessed for sampling by the Coalition.
- *Complementary wells* - have existing data to add to the GQTM but may not satisfy the same criteria as principal wells.

The ESJWQC network includes 12 principal wells which are all domestic wells owned by Coalition members. The ESJWQC GQTM Work Plan identified 74 complementary wells which are public water supply (PWS) wells with existing data that will be used to better understand changes in trends.

The GQTM design prioritizes areas for monitoring based on groundwater vulnerability, areas contributing recharge to communities reliant on groundwater, and top acreage commodities. The goal of the GQTM design is to utilize data from both principal and complementary wells to provide groundwater quality information for evaluation based on land use activities at different spatial scales. However, the GQTM program is designed to evolve over time based on data needs.

Therefore, the simple initial design of the well network requires an annual evaluation to assess if modification or supplementary wells/data should be added. A map of the spatial distribution for the current 12 principal wells is provided in Figure 8.

**Table 5. ESJWQC GQTM Principal Wells Site Locations.**

FIELD POINT NAME	WELL NAME	LATITUDE	LONGITUDE	YEAR DRILLED	WELL DEPTH (FT)	WELL USE
ESJQC00001	P01	37.7522	-120.994	1987	135	Domestic
ESJQC00002	P02	37.6467	-120.894	1988	180	Domestic
ESJQC00003	P03	37.6031	-121.048	1987	105	Domestic
ESJQC00004	P04	37.5641	-120.783	1977	136	Domestic
ESJQC00005	P05	37.4629	-120.772	1981	180	Domestic
ESJQC00006	P06	37.4048	-120.589	1993	236	Domestic
ESJQC00007	P07	37.3308	-120.735	2003	230	Domestic
ESJQC00008	P08	37.3178	-120.432	1990	180	Domestic
ESJQC00009	P09	37.3092	-120.556	1989	180	Domestic
ESJQC00010	P10	37.2144	-120.535	1965	180	Domestic
ESJQC00011	P11	37.1497	-120.347	UNK	UNK	Domestic
ESJQC00012	P12	36.9287	-120.092	1985	276	Domestic

UNK - Unknown



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Coordinate System: NAD 1983 StatePlane California II FIPS 6403 Feet  
Projection: property= Lambert Conformal Conic  
Units: Foot US  
Service Layer Credits: Shaded Relief. Copyright© 2011 Carl  
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## GROUNDWATER TREND MONITORING RESULTS

The East San Joaquin Water Quality Coalition began implementation of the Groundwater Quality Trend Monitoring Program (GQTM) in October 2018. The Coalition collected groundwater samples on October 30 and 31 at the 12 primary wells (Figure 8). Groundwater was analyzed for field parameters at each well (Table 9). Groundwater samples were delivered to Caltest Analytical Laboratory on October 31 and were analyzed for nutrients, anions, cations, and solids (Table 12).

## QUALITY ASSURANCE EVALUATION RESULTS

### Completeness

Completeness is assessed on three levels: field and transport, analytical, and batch completeness. Field and transport completeness are based on the number of samples successfully collected and transported to the appropriate laboratories. Field and transport completeness may be less than 100% due to bottle breakage during sample transport to the laboratory or inability to access a site. Wells that lack enough water to collect samples (e.g. dry) are considered “sampled” and are counted towards field and transport completeness. Analytical completeness is based on the number of samples successfully analyzed by the laboratory. Analytical completeness may be less than 100% due to bottles breaking while at the laboratory or if an analysis failed or was not performed due to laboratory error. Batch completeness assesses whether chemistry and toxicity batches were processed with the required QC samples as prescribed in the QAPP.

### Field and Transport and Analytical Completeness

Overall, field and transport completeness for well samples and field parameters was 100% for 2018 sampling (Table 45). All samples submitted to the laboratory were analyzed. Therefore, analytical completeness was 100% for 2018 (Table 45). Field parameter measurements (oxidation-reduction potential, DO, pH, SC, water temperature and turbidity) were taken at each site for all sampling events when there was enough water for sample collection. Oxidation-reduction potential and turbidity measurements are not required in the GQTM. Turbidity was measured to determine if a sample should be filtered.

Field duplicate and field blank samples are collected by sampling crews in the field and transported to the laboratories. These field QC samples are collected during each event, as prescribed by the groundwater QAPP. At a minimum, field blank and field duplicate samples must each comprise 5% of the samples collected (overall 10% field QC). Field QC samples were collected at a frequency of 12.5% of the environmental samples collected for 2018 (Table 46).

### Batch Completeness

Each chemistry batch must be processed with a minimum set of QC samples as prescribed in the groundwater QAPP. Batch completeness is determined based on whether all required QC

samples were run with every batch. One hundred percent of chemistry batches (18 of 18) met batch completeness requirements.

## Hold Time Compliance

Each sample must be stored, extracted (if applicable), and analyzed within a specific timeframe to meet hold time requirements as outlined in the groundwater QAPP. Results associated with hold time violations are flagged. All well samples were analyzed within hold time with an overall hold time compliance of 100% for 2018 (Table 47).

## Precision and Accuracy

Precision and accuracy for groundwater samples are evaluated for each type of QC sample analyzed during 2018 (Table 48 and Table 49).

The tables include:

- Evaluation of blank samples (field blank and laboratory blank): Table 48, Table 49;
- Evaluation of field duplicate precision for chemistry: Table 48;
- Evaluation of laboratory accuracy of recovery (LCS, MS): Table 49; and
- Evaluation of laboratory precision of duplicate samples (LCSD, MSD, and laboratory duplicate): Table 49.

Each batch from samples collected in October 2018 was processed with QC samples as outlined in the Batch Completeness section of this report. Evaluation of the precision and accuracy for each analyte is discussed in the sections below.

As outlined in the groundwater QAPP, QC samples include laboratory blank, field blank, field duplicate, LCS, MS, and laboratory duplicate (often LCSD or MSD samples) samples for all analytes listed in Table 46 with the following exceptions: 1) no MS samples are required for alkalinity as  $\text{CaCO}_3$ , bicarbonate, carbonate, hydroxide, and total dissolved solids (TDS), and 2) no LCS samples are run for carbonate and hydroxide.

All analytes were within the MQO acceptability criteria of 90% for blanks (field and laboratory), LCS, and lab duplicates (including LCSD and MSD). Analytes that were not within the MQO acceptability criteria of 90% are outlined below with explanations for accepting the data and considering the data usable.

Sodium failed to meet the 90% acceptability threshold for laboratory blanks (0 of 1, 0%). Sodium was detected in the laboratory blank at 0.05 mg/L, equal to the RL of 0.05 mg/L. The laboratory blank detection was less than 10 times the nearest environmental sample of 14 mg/L. The two field blank samples associated with this batch were non-detect. The sample contamination present in the laboratory blank did not affect the associated environmental results based on the non-detect field blanks and the comparatively high environmental sample results. Sodium results were accepted and are considered usable.

Matrix spike recoveries for nitrate (3 of 4, 75%) were outside of the 90% MQO acceptability criteria. A matrix spike recovery for nitrate was below the lower control limit of 80% with the matrix spike recovery at 45%. However, the matrix spike duplicate was within control limits at

96%. An additional MS and MSD were run with the batch and both recoveries were within control limits at 103% and 99%, respectively. The LCS associated with the batch recovered within limits at 102%. The batch was accepted based on the single acceptable MS recovery, the acceptable second set of MS and MSD recoveries, and the acceptable LCS recovery. All nitrate results were accepted and are considered usable.

## Corrective Actions

Corrective actions define the actions taken to stop the reoccurrence of non-conformities. In some cases, the Coalition addresses corrective action options with laboratories to improve QC measures that consistently demonstrate failure to meet MQOs.

No corrective actions were determined to be necessary for groundwater monitoring that occurred in 2018.



**Table 45. ESJWQC groundwater field and transport and analytical completeness: well sample counts and percentages.**

Samples collected during 2018. The table counts environmental grabs only; field QC are not included. Each analyte is sorted by sample type, method, and analyte in alphabetical order. Bolded rows represent analytes that did not meet the acceptability requirement.

METHOD	MATRIX	SAMPLE TYPE	ANALYTE	WELL SAMPLES SCHEDULED	SAMPLES COLLECTED	FIELD AND TRANSPORT COMPLETENESS (%)	TOTAL ENVIRONMENTAL SAMPLES ANALYZED	ANALYTICAL COMPLETENESS (%)
EPA 200.8	groundwater	Analytical	Boron	12	12	100.0	12	100.0
EPA 200.8	groundwater	Analytical	Calcium	12	12	100.0	12	100.0
EPA 200.8	groundwater	Analytical	Magnesium	12	12	100.0	12	100.0
EPA 200.8	groundwater	Analytical	Potassium	12	12	100.0	12	100.0
EPA 200.8	groundwater	Analytical	Sodium	12	12	100.0	12	100.0
EPA 300.0	groundwater	Analytical	Chloride	12	12	100.0	12	100.0
EPA 300.0	groundwater	Analytical	Sulfate	12	12	100.0	12	100.0
EPA 353.2	groundwater	Analytical	Nitrate + Nitrite as N	12	12	100.0	12	100.0
SM 2320 B	groundwater	Analytical	Alkalinity as CaCO3	12	12	100.0	12	100.0
SM 2320 B	groundwater	Analytical	Bicarbonate	12	12	100.0	12	100.0
SM 2320 B	groundwater	Analytical	Carbonate	12	12	100.0	12	100.0
SM 2320 B	groundwater	Analytical	Hydroxide	12	12	100.0	12	100.0
SM 2540 C	groundwater	Analytical	Total Dissolved Solids	12	12	100.0	12	100.0
NA	groundwater	Field Parameter	Oxidation-Reduction Potential <sup>1</sup>	12	12	100.0	NA	NA
SM 4500-O	groundwater	Field Parameter	Oxygen, Dissolved	12	12	100.0	NA	NA
EPA 150.1	groundwater	Field Parameter	pH	12	12	100.0	NA	NA
EPA 120.1	groundwater	Field Parameter	Specific Conductivity	12	12	100.0	NA	NA
SM 2550	groundwater	Field Parameter	Temperature	12	12	100.0	NA	NA
EPA 180.1	groundwater	Field Parameter	Turbidity <sup>1</sup>	12	12	100.0	NA	NA
<b>Total</b>				<b>228</b>	<b>228</b>	<b>100.0</b>	<b>156</b>	<b>100.0</b>

<sup>1</sup>Oxidation-Reduction Potential for Turbidity are optional field parameters that were collected when possible.

**Table 46. ESJQWC groundwater field QC completeness: total counts per analyte and completeness percentages.**

Samples collected during 2018. Completeness for each analyte that resulted in less than 5% is bolded.

METHOD	MATRIX	ANALYTE	TOTAL ENVIRONMENTAL SAMPLES	TOTAL FIELD DUPLICATE SAMPLES	TOTAL FIELD BLANK SAMPLES	TOTAL ENVIRONMENTAL & FIELD QCS SAMPLES	FIELD DUPLICATE COMPLETENESS (%)	FIELD BLANK COMPLETENESS (%)
EPA 200.8	groundwater	Boron	12	2	2	16	12.5	12.5
EPA 200.8	groundwater	Calcium	12	2	2	16	12.5	12.5
EPA 200.8	groundwater	Magnesium	12	2	2	16	12.5	12.5
EPA 200.8	groundwater	Potassium	12	2	2	16	12.5	12.5
EPA 200.8	groundwater	Sodium	12	2	2	16	12.5	12.5
EPA 300.0	groundwater	Chloride	12	2	2	16	12.5	12.5
EPA 300.0	groundwater	Sulfate	12	2	2	16	12.5	12.5

METHOD	MATRIX	ANALYTE	TOTAL ENVIRONMENTAL SAMPLES	TOTAL FIELD DUPLICATE SAMPLES	TOTAL FIELD BLANK SAMPLES	TOTAL ENVIRONMENTAL & FIELD QC SAMPLES	FIELD DUPLICATE COMPLETENESS (%)	FIELD BLANK COMPLETENESS (%)
EPA 353.2	groundwater	Nitrate + Nitrite as N	12	2	2	16	12.5	12.5
SM 2320 B	groundwater	Alkalinity as CaCO3	12	2	2	16	12.5	12.5
SM 2320 B	groundwater	Bicarbonate	12	2	2	16	12.5	12.5
SM 2320 B	groundwater	Carbonate	12	2	2	16	12.5	12.5
SM 2320 B	groundwater	Hydroxide	12	2	2	16	12.5	12.5
SM 2540 C	groundwater	Total Dissolved Solids	12	2	2	16	12.5	12.5
<b>Total</b>			<b>208</b>	<b>26</b>	<b>26</b>	<b>208</b>	<b>12.5</b>	<b>12.5</b>

**Table 47. ESJWQC summary of groundwater holding time evaluations for environmental, field blank, and field duplicate samples.**

Samples collected during 2018; sorted by method and analyte. Bolded rows represent analytes that did not meet the 90% acceptability requirement.

METHOD	MATRIX	ANALYTE	HOLD TIME	TOTAL SAMPLES ANALYZED	SAMPLES ANALYZED WITHIN HOLD TIME	ACCEPTABILITY MET (%)
EPA 200.8	groundwater	Boron	6 months	19	19	100.0
EPA 200.8	groundwater	Calcium	6 months	18	18	100.0
EPA 200.8	groundwater	Magnesium	6 months	19	19	100.0
EPA 200.8	groundwater	Potassium	6 months	19	19	100.0
EPA 200.8	groundwater	Sodium	6 months	19	19	100.0
EPA 300.0	groundwater	Chloride	28 days	20	20	100.0
EPA 300.0	groundwater	Sulfate	28 days	20	20	100.0
EPA 353.2	groundwater	Nitrate + Nitrite as N	28 days	19	19	100.0
SM 2320 B	groundwater	Alkalinity as CaCO3	14 days	19	19	100.0
SM 2320 B	groundwater	Bicarbonate	14 days	19	19	100.0
SM 2320 B	groundwater	Carbonate	14 days	19	19	100.0
SM 2320 B	groundwater	Hydroxide	14 days	19	19	100.0
SM 2540 C	groundwater	Total Dissolved Solids	7 days	20	20	100.0
<b>Total</b>				<b>249</b>	<b>249</b>	<b>100.0</b>

**Table 48. ESJWQC summary of groundwater field blank and field duplicate QC sample evaluations.**

Samples collected during 2018, sorted by sample type, method, and analyte. Bolded rows represent analytes that did not meet 90% acceptability requirement.

METHOD	MATRIX	ANALYTE	SAMPLE TYPE	FB DATA ACCEPTABILITY CRITERIA	TOTAL SAMPLES	SAMPLES WITHIN ACCEPTABILITY	ACCEPTABILITY MET (%)
EPA 200.8	groundwater	Boron	Field Blank	<RL or (environ. concentration/5)	2	2	100.0

METHOD	MATRIX	ANALYTE	SAMPLE TYPE	FB DATA ACCEPTABILITY CRITERIA	TOTAL SAMPLES	SAMPLES WITHIN ACCEPTABILITY	ACCEPTABILITY MET (%)
EPA 200.8	groundwater	Calcium	Field Blank	<RL or (environ. concentration/5)	2	2	100.0
EPA 200.8	groundwater	Magnesium	Field Blank	<RL or (environ. concentration/5)	2	2	100.0
EPA 200.8	groundwater	Potassium	Field Blank	<RL or (environ. concentration/5)	2	2	100.0
EPA 200.8	groundwater	Sodium	Field Blank	<RL or (environ. concentration/5)	2	2	100.0
EPA 300.0	groundwater	Chloride	Field Blank	<RL or (environ. concentration/5)	2	2	100.0
EPA 300.0	groundwater	Sulfate	Field Blank	<RL or (environ. concentration/5)	2	2	100.0
EPA 353.2	groundwater	Nitrate + Nitrite as N	Field Blank	<RL or (environ. concentration/5)	2	2	100.0
SM 2320 B	groundwater	Alkalinity as CaCO3	Field Blank	<RL or (environ. concentration/5)	2	2	100.0
SM 2320 B	groundwater	Bicarbonate	Field Blank	<RL or (environ. concentration/5)	2	2	100.0
SM 2320 B	groundwater	Carbonate	Field Blank	<RL or (environ. concentration/5)	2	2	100.0
SM 2320 B	groundwater	Hydroxide	Field Blank	<RL or (environ. concentration/5)	2	2	100.0
SM 2540 C	groundwater	Total Dissolved Solids	Field Blank	<RL or (environ. concentration/5)	2	2	100.0
<b>Field Blank Total</b>					<b>26</b>	<b>26</b>	<b>100.0</b>
EPA 200.8	groundwater	Boron	Field Duplicate	RPD ≤25	2	2	100.0
EPA 200.8	groundwater	Calcium	Field Duplicate	RPD ≤25	2	2	100.0
EPA 200.8	groundwater	Magnesium	Field Duplicate	RPD ≤25	2	2	100.0
EPA 200.8	groundwater	Potassium	Field Duplicate	RPD ≤25	2	2	100.0
EPA 200.8	groundwater	Sodium	Field Duplicate	RPD ≤25	2	2	100.0
EPA 300.0	groundwater	Chloride	Field Duplicate	RPD ≤25	2	2	100.0
EPA 300.0	groundwater	Sulfate	Field Duplicate	RPD ≤25	2	2	100.0
EPA 353.2	groundwater	Nitrate + Nitrite as N	Field Duplicate	RPD ≤25	2	2	100.0
SM 2320 B	groundwater	Alkalinity as CaCO3	Field Duplicate	RPD ≤25	2	2	100.0
SM 2320 B	groundwater	Bicarbonate	Field Duplicate	RPD ≤25	2	2	100.0
SM 2320 B	groundwater	Carbonate	Field Duplicate	RPD ≤25	2	2	100.0
SM 2320 B	groundwater	Hydroxide	Field Duplicate	RPD ≤25	2	2	100.0
SM 2540 C	groundwater	Total Dissolved Solids	Field Duplicate	RPD ≤25	2	2	100.0
<b>Field Duplicate Total</b>					<b>26</b>	<b>26</b>	<b>100.0</b>

**Table 49. ESJWQC summary of groundwater laboratory blank, laboratory control sample (LCS), matrix spike (MS), and laboratory duplicates (LCSD, MSD and environmental sample duplicates) QC sample evaluations.**

Sorted by sample type, method, and analyte. Non project matrix spikes, matrix spike duplicates, and laboratory duplicates are included for batch Quality Assurance completeness purposes. Bolded rows represent analytes that did not meet 90% acceptability requirement.

METHOD	MATRIX	ANALYTE	SAMPLE TYPE	DATA ACCEPTABILITY CRITERIA	TOTAL SAMPLES	SAMPLES WITHIN LIMITS	ACCEPTABILITY MET (%)
EPA 200.8	groundwater	Boron	Lab Blank	< RL	1	1	100.0
EPA 200.8	groundwater	Calcium	Lab Blank	< RL	1	1	100.0
EPA 200.8	groundwater	Magnesium	Lab Blank	< RL	1	1	100.0

METHOD	MATRIX	ANALYTE	SAMPLE TYPE	DATA ACCEPTABILITY CRITERIA	TOTAL SAMPLES	SAMPLES WITHIN LIMITS	ACCEPTABILITY MET (%)
EPA 200.8	groundwater	Potassium	Lab Blank	< RL	1	1	100.0
<b>EPA 200.8</b>	<b>groundwater</b>	<b>Sodium</b>	<b>Lab Blank</b>	<b>&lt; RL</b>	<b>1</b>	<b>0</b>	<b>0</b>
EPA 300.0	groundwater	Chloride	Lab Blank	< RL	2	2	100.0
EPA 300.0	groundwater	Sulfate	Lab Blank	< RL	2	2	100.0
EPA 353.2	groundwater	Nitrate + Nitrite as N	Lab Blank	< RL	1	1	100.0
SM 2320 B	groundwater	Alkalinity as CaCO3	Lab Blank	< RL	1	1	100.0
SM 2320 B	groundwater	Bicarbonate	Lab Blank	< RL	1	1	100.0
SM 2320 B	groundwater	Carbonate	Lab Blank	< RL	1	1	100.0
SM 2320 B	groundwater	Hydroxide	Lab Blank	< RL	1	1	100.0
SM 2540 C	groundwater	Total Dissolved Solids	Lab Blank	< RL	3	3	100.0
<b>Lab Blank Total</b>					<b>17</b>	<b>16</b>	<b>94.1</b>
EPA 200.8	groundwater	Boron	LCS <sup>1</sup>	PR 75-125	1	1	100.0
EPA 200.8	groundwater	Calcium	LCS <sup>1</sup>	PR 75-125	1	1	100.0
EPA 200.8	groundwater	Magnesium	LCS <sup>1</sup>	PR 75-125	1	1	100.0
EPA 200.8	groundwater	Potassium	LCS <sup>1</sup>	PR 75-125	1	1	100.0
EPA 200.8	groundwater	Sodium	LCS <sup>1</sup>	PR 75-125	1	1	100.0
EPA 300.0	groundwater	Chloride	LCS <sup>1</sup>	PR 75-125	3	3	100.0
EPA 300.0	groundwater	Sulfate	LCS <sup>1</sup>	PR 75-125	3	3	100.0
EPA 353.2	groundwater	Nitrate + Nitrite as N	LCS <sup>1</sup>	PR 90-110	1	1	100.0
SM 2320 B	groundwater	Alkalinity as CaCO3	LCS <sup>1</sup>	PR 75-125	1	1	100.0
SM 2320 B	groundwater	Bicarbonate	LCS <sup>1</sup>	PR 75-125	1	1	100.0
SM 2540 C	groundwater	Total Dissolved Solids	LCS <sup>1</sup>	PR 80-120	3	3	100.0
<b>LCS Total</b>					<b>17</b>	<b>17</b>	<b>100.0</b>
EPA 300.0	groundwater	Chloride	LCSD <sup>1</sup>	RPD ≤25	1	1	100.0
EPA 300.0	groundwater	Sulfate	LCSD <sup>1</sup>	RPD ≤25	1	1	100.0
<b>LCSD Total</b>					<b>2</b>	<b>2</b>	<b>100.0</b>
EPA 200.8	groundwater	Boron	MS <sup>1</sup>	75-125%	4	4	100.0
EPA 200.8	groundwater	Calcium	MS <sup>1</sup>	75-125%	4	4	100.0
EPA 200.8	groundwater	Magnesium	MS <sup>1</sup>	75-125%	4	4	100.0
EPA 200.8	groundwater	Potassium	MS <sup>1</sup>	75-125%	4	4	100.0
EPA 200.8	groundwater	Sodium	MS <sup>1</sup>	75-125%	4	4	100.0
EPA 300.0	groundwater	Chloride	MS <sup>1</sup>	75-125%	4	4	100.0
EPA 300.0	groundwater	Sulfate	MS <sup>1</sup>	75-125%	4	4	100.0
<b>EPA 353.2</b>	<b>groundwater</b>	<b>Nitrate + Nitrite as N</b>	<b>MS<sup>1</sup></b>	<b>80-120%</b>	<b>4</b>	<b>3</b>	<b>75.0</b>
<b>MS Total</b>					<b>32</b>	<b>31</b>	<b>96.9</b>
EPA 200.8	groundwater	Boron	MSD <sup>1</sup>	RPD ≤25	2	2	100.0

METHOD	MATRIX	ANALYTE	SAMPLE TYPE	DATA ACCEPTABILITY CRITERIA	TOTAL SAMPLES	SAMPLES WITHIN LIMITS	ACCEPTABILITY MET (%)
EPA 200.8	groundwater	Calcium	MSD <sup>1</sup>	RPD ≤25	2	2	100.0
EPA 200.8	groundwater	Magnesium	MSD <sup>1</sup>	RPD ≤25	2	2	100.0
EPA 200.8	groundwater	Potassium	MSD <sup>1</sup>	RPD ≤25	2	2	100.0
EPA 200.8	groundwater	Sodium	MSD <sup>1</sup>	RPD ≤25	2	2	100.0
EPA 300.0	groundwater	Chloride	MSD <sup>1</sup>	RPD ≤25	2	2	100.0
EPA 300.0	groundwater	Sulfate	MSD <sup>1</sup>	RPD ≤25	2	2	100.0
EPA 353.2	groundwater	Nitrate + Nitrite as N	MSD <sup>1</sup>	RPD ≤25	2	2	100.0
<b>MSD Total</b>					<b>16</b>	<b>16</b>	<b>100.0</b>
EPA 200.8	groundwater	Boron	Lab Duplicate	RPD ≤25	2	2	100.0
EPA 200.8	groundwater	Calcium	Lab Duplicate	RPD ≤25	2	2	100.0
EPA 200.8	groundwater	Magnesium	Lab Duplicate	RPD ≤25	2	2	100.0
EPA 200.8	groundwater	Potassium	Lab Duplicate	RPD ≤25	2	2	100.0
EPA 200.8	groundwater	Sodium	Lab Duplicate	RPD ≤25	2	2	100.0
EPA 300.0	groundwater	Chloride	Lab Duplicate	RPD ≤25	3	3	100.0
EPA 300.0	groundwater	Sulfate	Lab Duplicate	RPD ≤25	3	3	100.0
EPA 353.2	groundwater	Nitrate + Nitrite as N	Lab Duplicate	RPD ≤25	2	2	100.0
SM 2320 B	groundwater	Alkalinity as CaCO <sub>3</sub>	Lab Duplicate	RPD ≤25	2	2	100.0
SM 2320 B	groundwater	Bicarbonate	Lab Duplicate	RPD ≤25	2	2	100.0
SM 2320 B	groundwater	Carbonate	Lab Duplicate	RPD ≤25	2	2	100.0
SM 2320 B	groundwater	Hydroxide	Lab Duplicate	RPD ≤25	2	2	100.0
SM 2540 C	groundwater	Total Dissolved Solids	Lab Duplicate	RPD ≤25	1	1	100.0
<b>Lab Duplicate Total</b>					<b>27</b>	<b>27</b>	<b>100.0</b>

<sup>1</sup>LCS, LCSD, MS, and MSD are not run for all analytes and analytes that do not have these QC samples are not included in table.



## DISCUSSION OF GROUNDWATER MONITORING RESULTS

During 2018 groundwater well monitoring, nitrate + nitrite as N results ranged from non-detect (<0.07 mg/L) to 62 mg/L (Table 50). The nitrate + nitrite as N results are mapped in Figure 17. All results for well information, habitat results, field results, and chemistry results (field and laboratory QC) are included in Attachment B. All results have been loaded to GeoTracker.

### Time Concentration Figures

Time concentration figures will be generated once the Coalition has three years of data collected from principal well monitoring.

#### Table 50. ESJWQC 2018 GQTM nitrate + nitrite as N monitoring results.

Groundwater monitoring results for nitrate + nitrite as N (mg/L) collected and analyzed during 2018; sorted by filed point name.

FIELD POINT NAME	WATER USE CLASSIFICATION	SAMPLE DATE	COLLECTION TIME	SAMPLE TYPE CODE	NITRATE + NITRITE AS N (MG/L)
ESJQC00001	Domestic	10/31/2018	2:00 PM	Grab	1.7
ESJQC00002	Domestic	10/31/2018	11:50 AM	Grab	3.6
ESJQC00003	Domestic	10/31/2018	1:00 PM	Grab	10
ESJQC00004	Domestic	10/31/2018	11:00 AM	Grab	20
ESJQC00005	Domestic	10/31/2018	10:30 AM	Grab	62
ESJQC00006	Domestic	10/31/2018	9:40 AM	Grab	6.6
ESJQC00007	Domestic	10/31/2018	8:40 AM	Grab	ND
ESJQC00007	Domestic	10/31/2018	8:40 AM	Field Duplicate	ND
ESJQC00008	Domestic	10/30/2018	1:00 PM	Grab	12
ESJQC00009	Domestic	10/30/2018	1:50 PM	Grab	9
ESJQC00010	Domestic	10/30/2018	12:00 PM	Grab	9.1
ESJQC00011	Domestic	10/30/2018	11:10 AM	Grab	7.1
ESJQC00012	Domestic	10/30/2018	9:50 AM	Grab	4.1
ESJQC00012	Domestic	10/30/2018	9:50 AM	Grab	4

ND – non-detect

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Coordinate System: NAD 1983 StatePlane California 11 FIPS 6003 Feet  
Projection: property=Laurent Conformal Conic  
Units: Feet US  
Service Layer Credits: Shaded Relief. Copyright © 2014 Esri  
Hydrology: NHD hydrodata, 1:24,000 scale, <http://nhd.sage.gov/>  
Roads, highways, railroads: ESRI

